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(56) Documents Cited:
GB 2294992 A JP 090079475 A

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(54) Abstract Title: Expanding pipe stopper with anti-tilt member and cam

(57) The pipe stopper comprises an annular seal 16 between rigid circular co-axial plates 10, 12. The seal 16 expands radially as the plates 10, 12 move together, so as to engage the inside of the pipe 14. An anti-tilt member 32, which is integral with or attached to one of the plates 12, can engage the bore of the pipe 14. An axial projection 22 attached to one plate 10 passes through an aperture 24 in the other plate 12. The cam has a lever 38 and moves the plates 10, 12 together. The stopper can be used to plug a pipe in a man-hole.

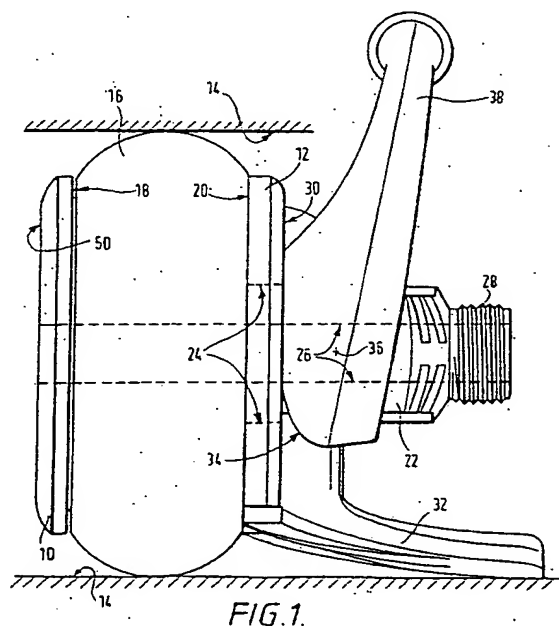


FIG. 1.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date but within the period prescribed by Rule 25(1) of the Patents Rules 1995.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

Original Printed on Recycled Paper

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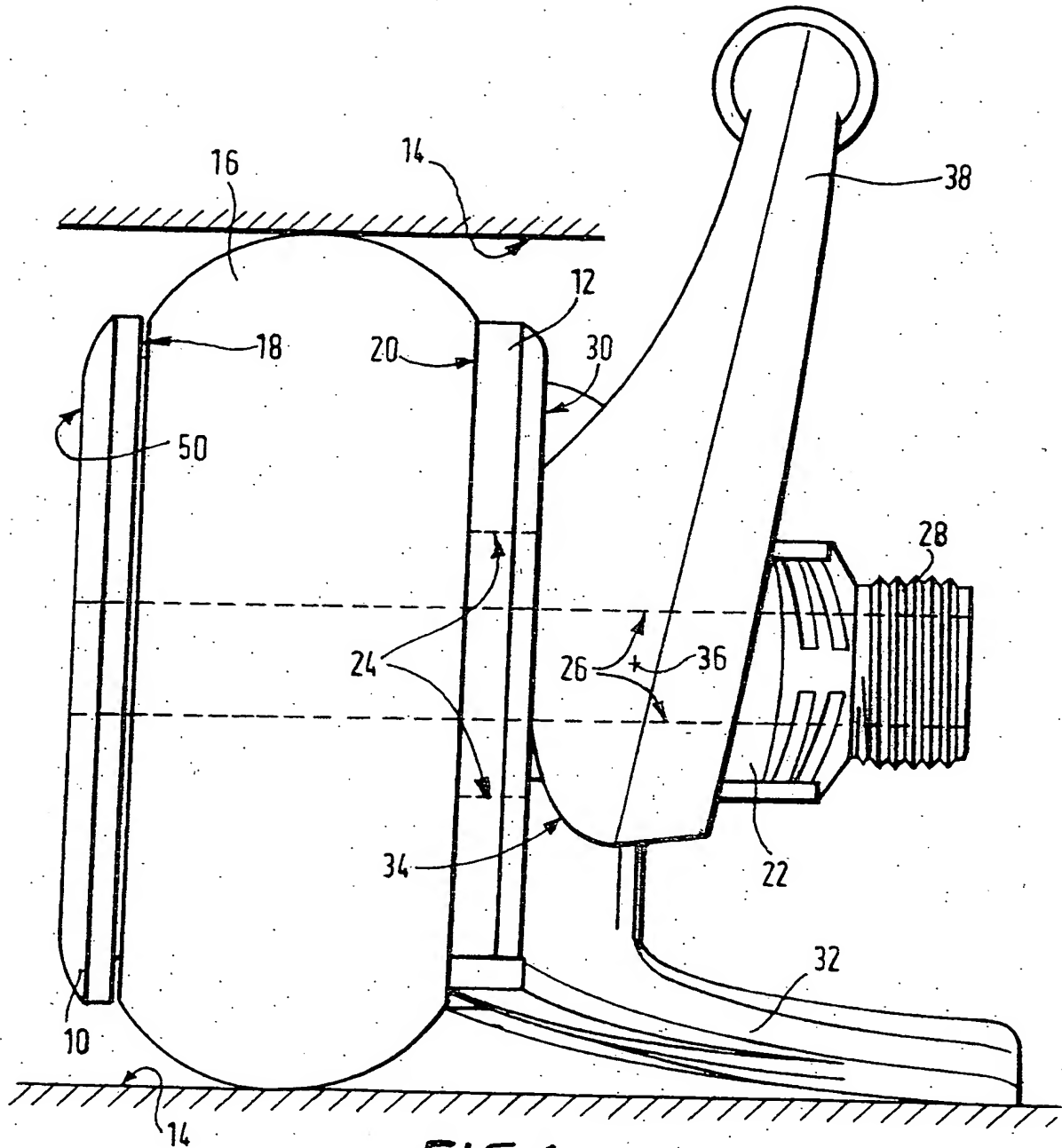
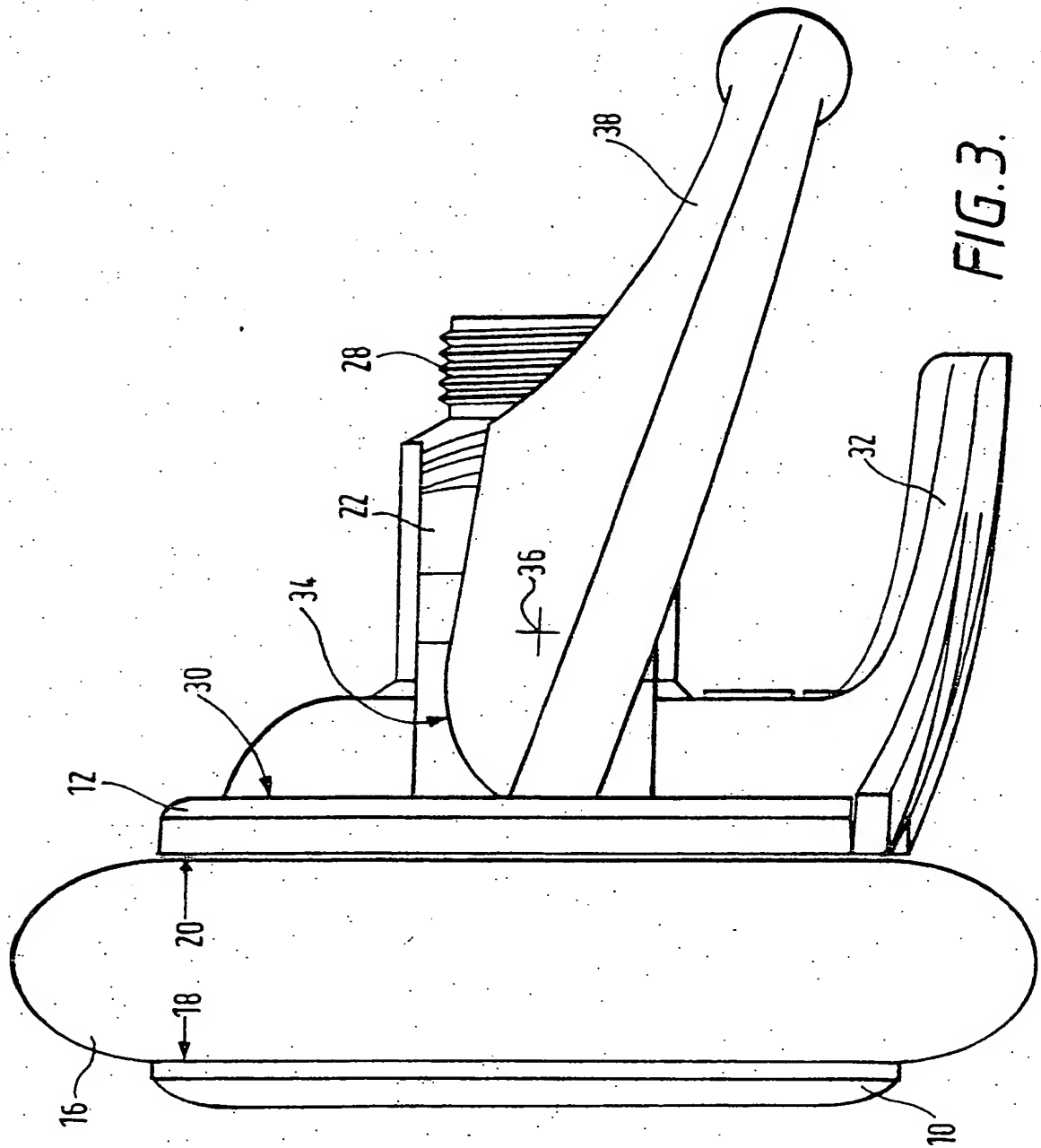


FIG. 1.



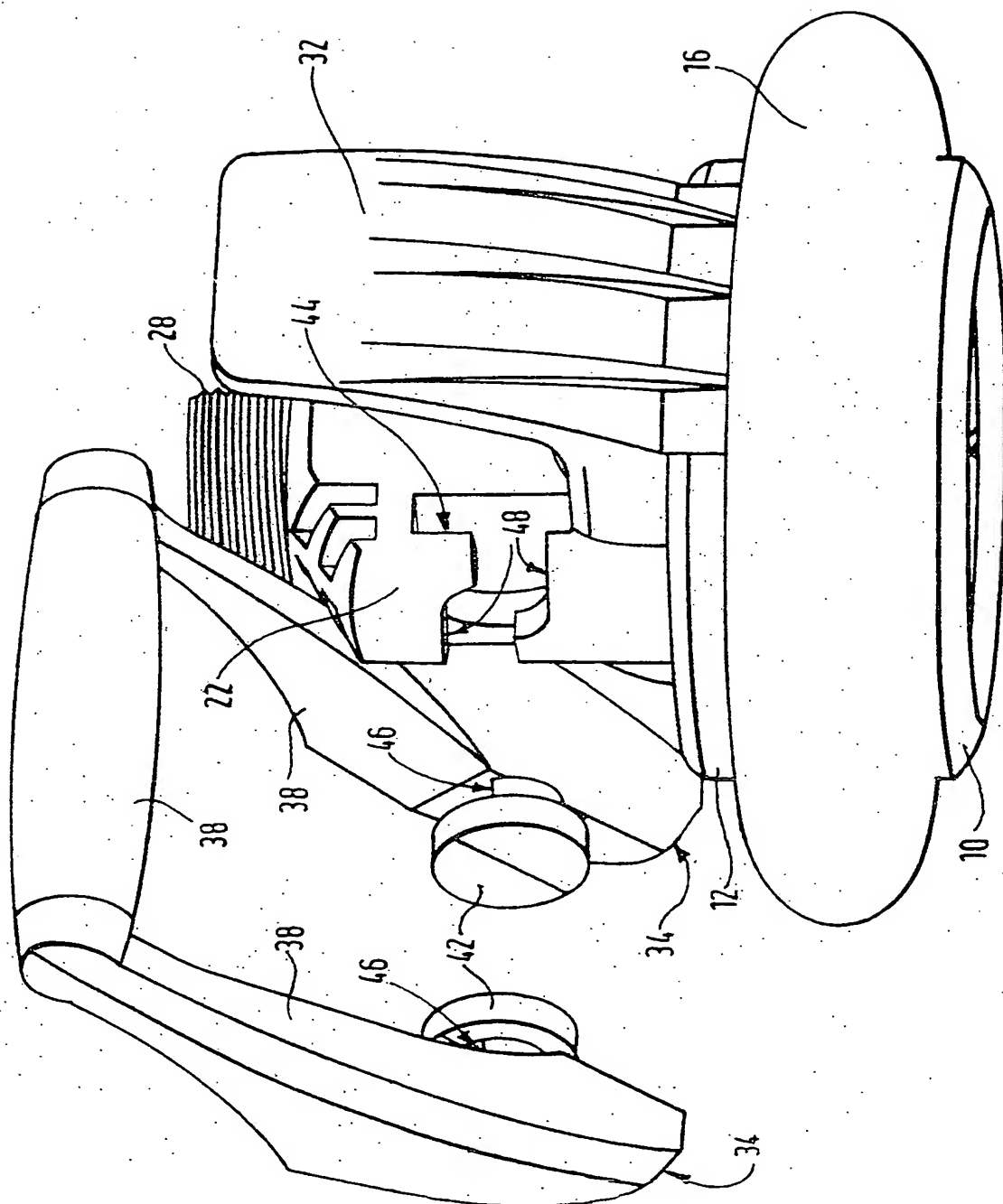


FIG. 4.

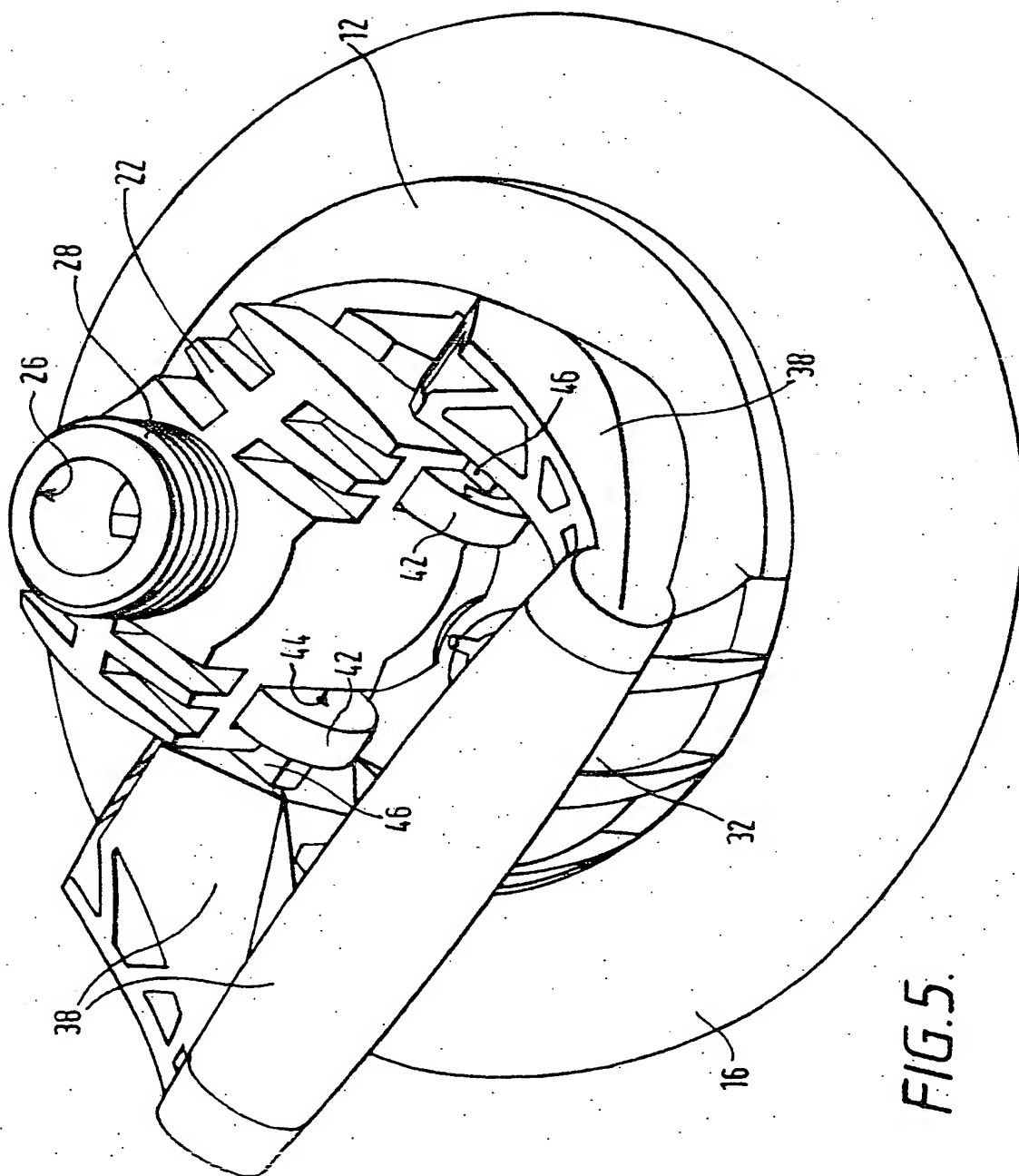


FIG. 5.

"An improved Expanding Pipe Stopper."

This invention relates to an improvement in expanding pipes stoppers for sewer pipes, industrial applications or the like, also known as drain plugs or bungs.

5 Various means have been proposed for facilitating the deployment of pipe stoppers. Such stoppers include arrangements wherein co-axial plates are moved towards each other by cam means to squeeze one or more radially outwardly-expandable seals disposed between them, the
10 stoppers being axially elongated to ensure their stable positioning in the pipe.

The object of the present invention is to provide an expanding pipe stopper which though not axially elongated can be stably secured in operative position and which also
15 then has a greatly improved ability to withstand pressure tending to dislodge it.

According to one aspect of the invention, an expanding pipe stopper for inserting within a pipe comprises two rigid circular co-axial plates of substantially the same
20 diameter adapted to be inserted wholly within a bore of the pipe, an outwardly-expandable annular flexible seal located between the adjacent peripheral surfaces of the plates so as to be capable of expanding radially thereupon, at least one axially-directed projection rigidly secured to or
25 integral with one of the plates and extending slideably through an aligned aperture in the other plate, cam means pivotable about a diametrical axis on the projection or

projections by a lever rigidly secured to or integral with the cam means between one position in which the plates do not compress the seal and another position in which the cam means force the plates relatively towards each other so as to compress and expand the seal outwardly to engage in sealing contact with the bore of the pipe, and a member rigidly secured to or integral with part of one of the remote peripheral surfaces of the plates and so directed axially as to contact the bore of the pipe for the purpose of providing a reactive force to tilting of the stopper out of its operative position perpendicular to the axis of the pipe.

The member is preferably integral with or rigidly secured to part of the peripheral surface of the apertured plate.

Preferably, the cam means carry two pivot pins each of which has an enlarged cylindrical head adapted to fit in an associated recess concentric with said diametrical axis in the projection or one of the projections, and a flat on its periphery adapted to slide through a cranked slot communicating with the recess in order to install the cam means and the lever on the projection or projections in a first orientation of said means and lever, whereafter said means and lever are rotated about said diametrical axis between a second orientation constituting said one position and a third orientation constituting said other position.

Preferably, also, a single central projection is provided.

Preferably, means are provided for preventing relative rotation of the plates, and the member is disposed in a
5 plane perpendicular to the axis of the cam means.

Preferably, also, the means for preventing relative rotation of the plates comprise a mutually corresponding rectangular cross-sectional shape of the projection and the aperture.

10 Preferably, the projection has an axial bore and a screw-threaded end remote from the associated plate for the connection of a nipple to enable pressure-testing of a pipe to be effected.

Alternatively, two diametrically-opposed parallel
15 projections and two apertures aligned with said projections are provided, and the cam means are disposed centrally between said projections.

According to another aspect of the invention, a method of stopping a pipe in a man-hole comprises deploying an
20 expanding pipe stopper according to the fifth paragraph hereof within one of the ends of the pipe with the member contacting the bore of the pipe where it forms the open channel section connecting said ends.

A preferred embodiment of the invention will now be
25 described, by way of example only, with reference to the accompanying drawings of which:-

Figure 1 is a side elevation of an expanding pipe stopper in its non-operative state;

Figure 2 is an end view of the stopper in its non-operative state;

5 Figure 3 is a side elevation of the stopper in its operative state;

Figure 4 is a perspective partly exploded view of the stopper with its cam means and associated lever orientated at the angle required for their installation; and

10 Figure 5 is a different perspective view of the stopper with said means and lever installed but still orientated as in Figure 4.

Referring now to the drawings, an expanding pipe stopper for inserting within a pipe includes two rigid
15 circular co-axial plates 10 and 12 of substantially the same diameter moulded from plastics material and adapted to be inserted wholly within a bore 14 (see Figure 1) of the pipe. An outwardly-expandable annular flexible seal 16 of rubber or the like is located between annular seats (not
20 shown) in the adjacent peripheral surfaces 18 and 20 of the plates so as to be capable of expanding radially therefrom as shown unrestrained by a pipe in Figure 3. A single central axially-directed projection or tower 22 is moulded integrally with the plate 10 and extends slideably through
25 an aligned central aperture 24 moulded in the plate 12. The projection 22 has an axial bore 26 and a screw-threaded end 28 remote from the plate 10 for the connection of a

conventional nipple (not shown) to enable pressure-testing of a pipe to be effected or an end cap (not shown) to effect sealing. Moulded integrally with part of that peripheral surface 30 of the plate 12 which is remote from the plate 10 is a member or heel 32 which is so directed axially as to contact the bore 14 of the pipe for the purpose of providing a reactive force to tilting of the stopper out of its operative position perpendicular to the axis of the pipe for the reasons hereinafter referred to.

10 The member 32 has an outer surface 33 (see Figure 2) formed as an arc of substantially the same diameter as the bore 14 of the pipe in order to seat closely therein. Cam means 34 pivotal about a diametrical axis 36 (see Figure 2) on the projection 22 are moulded integrally from plastics material

15 at the ends of a bifurcated hand lever 38. Said cam means and lever are pivotable between one position shown in Figures 1 and 2 in which the plates 10 and 12 do not compress the seal 16 and another position shown in Figure 3 in which the cam means 34 force said plates relatively

20 towards each other so as to compress and expand the seal 16 outwardly to engage in sealing contact with the bore 14 of the pipe. Means comprising a mutually corresponding rectangular cross-sectional shape of the projection 22 and the aperture 24 are provided for preventing relative

25 rotation and radially-offset displacement of the plates 10 and 12, and the axially-extending centre-line of the member 32 is disposed in a plane 40 (see Figure 2) perpendicular

to the axis of the cam means 34. As best seen in Figures 4 and 5, the cam means 34 carry two pivot pins each of which has an enlarged cylindrical head 42 adapted to fit in an associated recess 44 concentric with the axis 36 in the projection 22, and a flat 46 on its periphery adapted to be slid through a cranked slot (see Figure 4) communicating with the recess 44 from that end of said slot adjacent the member 22 in order to install the cam means 34 and the lever 38 on the projection 22 in a first orientation of said means and lever as shown in Figure 5. Said means and lever are then rotated about the axis 36 out of said first orientation to render them captive and thereafter are moved operatively in an arc between a second orientation (see Figures 1 and 2) constituting said one, non-operative, position and a third orientation (see Figure 3) constituting said other, operative, position. When the enlarged cylindrical heads 42 are engaged in the recesses 44, the cam means 34 and the hand lever 38 cannot be disassembled except when they are in said first orientation. Thus the pivot pins and their associated recesses 44 and slots 48 are the sole means for holding all of the components of the stopper in assembled position, and for enabling them to be dismantled if desired.

In the preferred mode of operation of the expanding pipe stopper, it is deployed with the seal 16 disposed just inside one of the ends of a pipe in a man-hole and with the member 32 contacting the bore of the pipe where it forms

the open channel section connecting said ends, thus providing maximum accessibility to the hand lever 38 and maximum visibility to check correct installation and operational integrity of the stopper. Regardless of how the stopper is deployed the member 32 is arranged to provide a reactive force to tilting of the stopper out of its operative position perpendicular to the axis of the pipe for two advantageous reasons. Firstly, it facilitates deployment of the stopper by enabling the lever 38 to be moved with one hand into said other, operative, position. Secondly, we have ascertained that failure of pipe stoppers occurs when minor leakage at the weakest point around the circumference of the seal causes the stopper to tilt, and that provision of the member 32 increases the resistance to tilting in these circumstances so as to render the stopper capable of withstanding up to four times more pressure than conventional stoppers.

Modifications possible without departing from the scope of the invention include the following:-

The member or heel can be rigidly secured to or moulded integrally with part of that peripheral surface (see Figure 1) of the plate 10 which is remote from the plate 12, directed axially away from the plate 12 and disposed diametrically opposite the illustrated position of the preferred member 32.

Two diametrically-opposed parallel projections or towers and two apertures aligned with said projections can

be provided, the cam means being disposed centrally between said projections. Pivot pins and associated recesses and slots similar to those of the preferred embodiment can still be employed. This arrangement inherently prevents
5 relative rotation of the plates.

The bore 26 and provision for the connection of a nipple can be omitted.

A simple pivot pin for the cam means and hand lever can be employed.

10 With a single central projection or tower, means for preventing relative rotation of the plates can be omitted by simply making the projection cylindrical and the aperture circular, though the stopper will then be more difficult to deploy because the member or heel must be
15 suitably positioned manually in order to provide a reactive force to tilting of the stopper.

Claims:-

1. An expanding pipe stopper for inserting within a pipe comprising two rigid circular co-axial plates of substantially the same diameter adapted to be inserted wholly within a bore of the pipe, an outwardly-expandable annular flexible seal located between the adjacent peripheral surfaces of the plates so as to be capable of expanding radially therefrom, at least one axially-directed projection rigidly secured to or integral with one of the plates and extending slideably through an aligned aperture in the other plate, cam means pivotable about a diametrical axis on the projection or projections by a lever rigidly secured to or integral with the cam means between one position in which the plates do not compress the seal and another position in which the cam means force the plates relatively towards each other so as to compress and expand the seal outwardly to engage in sealing contact with the bore of the pipe, and a member rigidly secured to or integral with part of one of the remote peripheral surfaces of the plates and so directed axially as to contact the bore of the pipe for the purpose of providing a reactive force to tilting of the stopper out of its operative position perpendicular to the axis of the pipe.
2. An expanding pipe stopper according to claim 1, wherein the member is integral with or rigidly secured to part of the peripheral surface of the apertured plate.

3. An expanding pipe stopper according to either of the preceding claims, wherein the cam means carry two pivot pins each of which has an enlarged cylindrical head adapted to fit in an associated recess concentric with said diametrical axis in the projection or one of the projections, and a flat on its periphery adapted to be slid through a cranked slot communicating with the recess in order to install the cam means and the lever on the projection or projections in a first orientation of said means and lever, whereafter said means and lever are rotated about said diametrical axis between a second orientation constituting said one position and a third orientation constituting said other position.
4. An expanding pipe stopper according to any one of the preceding claims, wherein a single central projection is provided.
5. An expanding pipe stopper according to claim 4, wherein means are provided for preventing relative rotation of the plates, and the member is disposed in a plane perpendicular to the axis of the cam means.
6. An expanding pipe stopper according to claim 5, wherein the means for preventing relative rotation of the plates comprise a mutually corresponding rectangular cross-sectional shape of the projection and the aperture.
7. An expanding pipe stopper according to any one of claims 4 to 6, wherein the projection has an axial bore and a screw-threaded end remote from the associated plate for

the connection of a nipple to enable pressure-testing of a pipe to be effected.

8. An expanding pipe stopper according to any one of claims 1 to 3, wherein two diametrically-opposed parallel
5 projections and two apertures aligned with said projections are provided, and the cam means are disposed centrally between said projections.

9. A method of stopping a pipe in a man-hole comprising deploying an expanding pipe stopper according to the claim
10 2 within one of the ends of the pipe with the member contacting the bore of the pipe where it forms the open channel section connecting said ends.

10. An expanding pipe stopper constructed, arranged and adapted to operate substantially as hereinbefore described
15 with reference to, and as illustrated by, the accompanying drawings.

11. A method of stopping a pipe in a man-hole, substantially as hereinbefore described.



INVESTOR IN PEOPLE

Application No: GB 0306424.3

Claims searched: 1-11

Examiner:

Robert Black

Date of search:

9 December 2003

Patents Act 1977 : Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
Y	1, 4 and 9	JP 09 0079475 A (SHINKO) see especially WPI abstract 1997-243294, PAJ abstract and the figure
Y	1, 4 and 9	GB 2294992 A (CAMIT) see especially figure 4 and page 7 line 23 to page 9 line 1

Categories:

X Document indicating lack of novelty or inventive step	A Document indicating technological background and/or state of the art.
Y Document indicating lack of inventive step if combined with one or more other documents of same category.	P Document published on or after the declared priority date but before the filing date of this invention.
& Member of the same patent family	E Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^v:

F2P

Worldwide search of patent documents classified in the following areas of the IPC⁷:

F16L

The following online and other databases have been used in the preparation of this search report:

EPODOC; WPI; PAJ